Birhane Fitwi

Rekha Gupta

23742

Group No 4

A. Thesis

Sleep deprivation has a variety of short term and long-term effects on the cognitive functions of the average person, affecting key areas of a person's actions and thinking temporarily and permanently.

B. Full-Sentence Outline

I. Sleep deprivation definition, types and statistics

a. Introducing the term sleep deprivation

Sleep deprivation occurs when a person is not able to get enough sleep to feel refreshed and function well. Sleep deprivation is a common experience of millions of people world-wide. Even though it has always been underestimated, its effects have significantly caused a long-term and short-term cognitive decline.

b. What falls under the term "sleep deprivation"?

i. Narcolepsy is a chronic sleep disorder which is characterized by excessive day sleep that may have severe consequences in the patient.
ii. Insomnia: is defined by the presence of an individual's report of difficulty with sleep or generally characterized as a positive answer to the question "Do you have difficulty falling or staying asleep.
iii. Sleep Apnea: is a sleep disruption disorder which is caused by breathing problems.
iv. Restless leg syndrome is neurological sensory-motor disorder that is characterized by intense restlessness and unpleasant creeping sensations deep inside the lower legs.

c. Statistics:

The statistics of many studies on the relationship of sleep deprivation and cognitive function have revealed that two hours less sleep than usual can slow a person's reaction time by 50%. It also slows down the attentions span by 20%, decreases short-memory recall ability by 40% and increases poor decision-making errors by 20%.

II. Risk factors and causes of sleep deprivation

a. Smoking and Drinking: Nicotine, a stimulant consumed during smoking can subject one to an increase in alertness which can in turn take many hours of healthy sleep away from the person. Alcohol on the other hand reduces the amount of time spent in a deeper restorative sleep stage. If a person is not getting the deeper restorative stage quality sleep, he/she is subjected to sleep deprivation.
b. Anxiety and stress: when a person is stressed, or anxious, the body's stress response is triggered. This trigger will cause psychological distress and changes in blood pressure and heart rates. For the body to do these, some level of sleep will be wasted that can cause sleep deprivation.
c. Environmental factors: If our sleeping surroundings are extremely hot or extremely cold temperature or noisy area or bright lights, healthy sleep hours can be impossible.
d. Pain: can cause sleep factors like frequent awakening, night sleep fragmentation, discomfort, and decreased sleep quality that contribute much the sleep deprivation.
e. Neurodegenerative diseases: are diseases associated with the brain function and parts of nervous systems that are responsible for sleep-regulation. When someone suffers from these diseases, they suffer sleep imbalance and eventually sleep deprivation.

III. The short term and physical effects of sleep deprivation

a. Emotional distress: refers to different experiences of mental and emotional tensions that can either be the causes of sleep deprivation or the results of severe and chronic levels of sleep deprivation. Emotional wellbeing can be directly related to sleep deprivation.
b. Decreased concentration: when someone suffers from sleep deprivation, their brain is not functioning properly. The lack of sleep will affect the information processes performance inside their brain in a way that can cause brain instability and lack of concentration.
c. Memory loss: After a proper hour of sleep, one can feel memory is consolidated and revitalized in a way that sharpens the encoding and retrieval potential of the memory functions. If the person didn't get enough sleep or is suffering from sleep deprivation, these memory functions are not properly done, because it's partly lost.

IV. The long-term consequences of sleep deprivation

a. Alzheimer's: is a neurodegenerative disease known for accumulating protein called beta-amyloid. This protein is cleared by the process known as glymphatic system during sleeping hours of a person. If a person suffers sleep deprivation, this important waste clearing process is not performed, which in the long term can be to develop Alzheimer's.
b. Mental Illness: There is a two-way relationship between mental illness and sleep deprivation. On one hand sleep deprivation is the symptom of a mental illness. On the other hand, sleep deprivation can also be the cause of mental illness. Conditions of mental illnesses such depression and anxiety can easily be exacerbated.
c. Underlying medical condition: Many of the human body's physiological processes need an adequate amount of sleep a day to maintain its proper functions. For example, sleep is vital for the proper functionality of the immune system, which is the key player in underlying medical conditions. If someone is in a constant condition of sleep deprivation, then his/her physiological processes are not performed in a timely manner.

V. Rebuttal

a. In many cases, genetics plays a factor in cognitive impairment of an individual. Many of these genetically associated cognitive malfunctions sometimes are attributed to sleep deprivation, which is not the case all the time. For example, a person with down syndrome or fragile x may have cognitive impairment which is not related to sleep deprivation.
b. Diseases that advance are characterized by their progression ability to destroy the brain cells, brain communication and inflammation. When these factors are later reflected in the overall cognitive state of the individual, careful study and analysis will be needed not to associate cognitive diminishing of such causes to sleep deprivation.
c. Poor diet, as it is the reason for many physiological and mental discomforts, can also be the reason for cognitive dissonance. According to the Journal Neurology, Processed foods rich in fat and sugar are associated with poorer cognitive function, decreased memory and slow processing speeds.
d. Even though these three rebuttals are factored in as an argument for possible change of thesis, at this point the thesis still stands as "Sleep deprivation has a variety of short term and long-term effects on the cognitive functions of the average person, affecting key areas of a person's actions and thinking temporarily and permanently."

VI. Conclusion

Sleep deprivation has a significant impact on cognitive function of many Americans, both in the short term and long term. In the short term, it can lead to poor decision making, diminished memory capacity, slow reaction response and so on. In the long term, it can

develop into neurodegenerative diseases such as Alzheimer's and dementia. Overall, minimizing risk factors such as smoking, drinking, and stress in addition to prioritizing and optimizing regular-sufficient sleep is essential for maintaining maximum cognitive performance in many areas of tasks.

C. ODU Library's-Keyword Title Search

1. Search Terms
- Sleep deprivation
- Sleep disorder
- Cognitive function
- Sleep deprivation and cognitive function
- Long-term
- Short-term

2. Rejected article:

Alhaider, I. A., Aleisa, A. M., Tran, T. T., Alzoubi, K. H., & Alkadhi, K. A. (2010). Chronic Caffeine Treatment Prevents Sleep Deprivation-Induced Impairment of Cognitive Function and Synaptic Plasticity. *Sleep (New York, N.Y.), 33*(4), 437-444. https://doi.org/10.1093/sleep/33.4.437

This study was taken to provide a detailed account of the effect of chronic treatment with a small dose of caffeine on the deleterious effects of sleep loss on brain function in rats. It investigated the effects of chronic (4 weeks) caffeine treatment (0.3 g/L in drinking water) on memory impairment in acutely (24 h) sleep-deprived adult male Wistar rats.

Here it is clear that the focus of the study is to examine the effect of small doses of caffeine on the damaging effect of sleep loss on a brain function, while the thesis of this paper is to find out the effects of sleep deprivation on cognitive functions, therefore not relevant to the thesis. Currency (Published in 2010) is another factor for the rejection of this article.

D. Journal Database-Search #1

1. specific Journal Database
   PubMed
2. Subject Headings:
   Health areas
3. Search Terminology

a. Initial keyword Search: sleep deprivation and Cognitive function.
b. Second keyword Search: sleep deprivation and thinking.

4. Accepted Article:

Thomas, J., Overeem, S., & Claassen, J. A. H. R. (2019). Long-Term Occupational Sleep Loss and Post-Retirement Cognitive Decline or Dementia. *Dement Geriatr Cogn Disord, 48*(1-2), 105-112. This article made it to the accepted sources because it is found to be currently relevant, with credible authors, accurate and serving a good ethical purpose.

This article generally covers the contribution of long-term sleep deprivation on post-retirement cognitive decline. Neurodegenerative diseases, Alzheimer's and dementia health issues are mentioned as possible effects of long-term sleep deprivation.

The currency of this article is timely. It was first published in 2019 (3-4 years ago). The relevancy factor also fits well in that it satisfies the material interest of this thesis. Authors authority can be validated through the authors address association to Department of Geriatric Medicine, Radboud University Medical Center, Nijmegen, The Netherlands. The accuracy of the study can be weighed by looking at the extensivity of data taken from about 500 people, 50 of them having irregular work-schedules that affected their sleep in a period of more than 25 years. Finally, the purpose of this article is clearly stated on the research's disclosure statement that the authors have no conflict-of-interest and Internationale Stichting Alzheimer Onderzoek, has partially funded the study but did not have any role in designing or conducting of the study.

This article made it to the accepted sources because it is found to be currently relevant, with credible authors, accurate and serving a good ethical purpose.

E. Journal Database search #2

1. Specific Journal Database:

   Medline
2. Subject headings:
   Index Medicus
   Human
   Animal
3. Search Terminology

   a. Sleep deprivation and cognitive function
      - Narrowed down to long term OR short term

4. Rejected Article

The Interaction Effect of Sleep Deprivation and Treadmill Exercise in Various Durations on Spatial Memory with Respect to the Oxidative Status of Rats. (2023). Neurochemical Research, https://doi.org/10.1007/s11064-023-03890-3

In contrast to many of the studies and articles done and written on the relationship of sleep deprivation and cognitive function, this article is trying to claim that sleep deprivation can improve a cognitive function, something which may need a deeper analysis on the claim. It claims that Treadmill exercise on a long-term sleep lost (24) can show cognitive improvement rather than cognitive decline, which need to be taken with a grain of salt.
This article is published in 2023 which satisfies currency publication threshold. But, because this article is about treadmill exercise's contribution in reversing the long hours-sleep deprivation cognitive decline, it doesn't directly address the thesis statement. The author seems to be credible as he has shown in about 7 medical journal publications.

However, to determine the accuracy of the study further analysis and references need to be conducted. Finally, no unethical intent for the purpose of this publication has been noticed.

F. Google Scholar

1. Search Terminology

   Sleep deprivation
   Cognitive performance
   Short term effect
   Long term effect

2. The relevant section of this book, pages pp 318-326 has been acquired, to access the necessary material for this thesis.
3. Accepted book:

   June J. Pilcher, Allen I. Huffcutt, Effects of Sleep Deprivation on Performance: A Meta-Analysis, *Sleep*, Volume 19, Issue 4, June 1996, Pages 318–326, https://doi.org/10.1093/sleep/19.4.318
   This article is about the effects of sleep deprivation on cognitive performance, done through a newly introduced analysis technic to the subject area of sleep deprivation and cognitive abilities, a Meta-Analysis. This technic used about 19 original research data, 143 study coefficients and 1932 sample sizes to determine the overall trend of sleep deprivation and cognitive performance relationship. It suggested that sleep deprivation strongly affects human cognitive functioning, especially the mood.
   This book is taken as an accepted source based on the method it has used. It used a quantitative, mathematical summary model of much research from different periods of time to determine the result. Since many research periods are included in this meta-analysis, currency is not considered as book quality criteria. This book titled sleep deprivation and diseases was found to be relevant to the thesis. The authors of the book from the Center for Depression, Anxiety, and Stress Research, McLean Hospital, Harvard Medical School, Belmont, MA, USA seem credible. Accuracy confirms the material in this search is consistent with the rest of the research findings. No unethical intent for any other purpose than academic contribution is noticed.

Reference:

Alhaider, I. A., Aleisa, A. M., Tran, T. T., Alzoubi, K. H., & Alkadhi, K. A. (2010). Chronic Caffeine Treatment Prevents Sleep Deprivation-Induced Impairment of Cognitive Function and Synaptic Plasticity. *Sleep (New York, N.Y.)*, *33*(4), 437-444. https://doi.org/10.1093/sleep/33.4.437

Thomas, J., Overeem, S., & Claassen, J. A. H. R. (2019). Long-Term Occupational Sleep Loss and Post-Retirement Cognitive Decline or Dementia. *Dement Geriatr Cogn Disord*, *48*(1-2), 105-112. https://doi.org/10.1159/000504020

The Interaction Effect of Sleep Deprivation and Treadmill Exercise in Various Durations on Spatial Memory with Respect to the Oxidative Status of Rats. (2023). Neurochemical Research, https://doi.org/10.1007/s11064-023-03890-3

June J. Pilcher, Allen I. Huffcutt, Effects of Sleep Deprivation on Performance: A Meta-Analysis, *Sleep*, Volume 19, Issue 4, June 1996, Pages 318–326, https://doi.org/10.1093/sleep/19.4.318